Bureau International des Poids et Mesures

Approved by the CIPM in October 2015

RECOMMENDED VALUES OF STANDARD FREQUENCIES FOR APPLICATIONS INCLUDING THE PRACTICAL REALIZATION OF THE METRE AND SECONDARY REPRESENTATIONS OF THE DEFINITION OF THE SECOND

HYDROGEN ^{1}H ATOM ($f \approx 1233$ THz)

^{1}H neutral atom, 1S – 2S unperturbed optical transition

1. Recommended value [1] of the frequency:

$f(^1\mathrm{H}) =$ 1 233 030 706 593 514 Hz

equivalent to

$\lambda(^1\mathrm{H}) =$ 243 134 624.626 044 fm,

with an estimated relative standard uncertainty of 9×10^{-15}.

Note: The 1S - 2S transition is excited by two photons of the frequency 1 233 THz

2. Source data

Adopted value

$f(^1\mathrm{H}) = 1\,233\,030\,706\,593\,514$ Hz $\qquad u_c/y = 9 \times 10^{-15}$

calculated from

2 x $f(^1\mathrm{H})$ / Hz	u / Hz	source data
2 466 061 413 187 035	10	[2]
2 466 061 413 187 018	11	[3]

as a weighted mean of the above values divided by two.

Given the noticeable drift of the values of the past measurements [3] and the fact that the values come from a single laboratory the CCTF considered it prudent to attribute an increased standard uncertainty by a factor of three.

3. References

[1] CIPM Recommendation 2 (CI-2015): Updates to the list of standard frequencies
http://www.bipm.org/jsp/en/CIPMRecommendations.jsp

[2] C. G. Parthey, A. Matveev, J. Alnis, B. Bernhardt, A. Beyer, R. Holzwarth, A. Maistrou, R. Pohl, K. Predehl, T. Udem, T. Wilken, N. Kolachevsky, M. Abgrall, D. Rovera, C. Salomon, P. Laurent, and T. W. Hänsch: Improved Measurement of the Hydrogen 1S–2S Transition Frequency, *Phys. Rev. Lett.* **107**, 203001 (2011).

[3] A. Matveev, Ch. G. Parthey, K. Predehl, J. Alnis, A. Beyer, R. Holzwarth, Th. Udem, T. Wilken, N. Kolachevsky, M. Abgrall, D. Rovera, Ch. Salomon, Ph. Laurent, G. Grosche, O. Terra, Th. Legero, H. Schnatz, S. Weyers, B. Altschul, Th. W. Hänsch: Precision Measurement of the Hydrogen 1S-2S Frequency via a 920-km Fiber Link, *Phys. Rev. Lett.* **110**, 230801 (2